



Written Assignment 7

Introduction To Computer Systems (Carnegie Mellon University)



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15-213: Introduction to Computer Systems

Written Assignment 7

This written homework covers dynamic memory allocation and the implementation of an explicit dynamic memory allocator.

Directions

Complete the question(s) on the following pages with single paragraph answers. These questions are not meant to be particularly long! Once you are done, submit this assignment on Canvas.

Below is an example question and answer.

Q: Please describe the benefit of 2s-complement signed integers versus other approaches (such as 1s-complement or signed-magnitude).

A: For both 1s-complement and signed-magnitude representations of signed integers, we end up representing both -0 and +0, which gets inconvenient when the computer wants to test for a zero result. Additionally, in both of these representations, implementing addition/subtraction is complicated. With 2s-complement, the hardware for addition / subtraction is the same for both signed and unsigned inputs.

Grading

Each assignment will be graded in two parts:

1. Does this work indicate any effort? (e.g. it's not copied from a homework for another class or from the book)
2. Three peers will provide short, constructive feedback.

Due Date

This assignment is due on October 28, 11:59 PM EST. Remember to convert this time to the timezone you currently reside in.

Question 1

What is internal fragmentation? What is external fragmentation? Compare and contrast the fragmentation present in implicit and explicit lists. Give an example of metadata for an implicit list implementation and a different example for an explicit list implementation and explain the purpose of each.

Question 2

One recurring problem within systems design is that throughput and utilization are often at odds. Provide an example of how this phenomenon is demonstrated in the implementation of a dynamic memory allocator, and explain the contrasting trade-offs.